UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

BIO-RAD LABORATORIES, INC. and PRESIDENT AND FELLOWS OF HARVARD COLLEGE, Plaintiffs, v. 10X GENOMICS, INC. Defendant,	)	CIVIL ACTION NO. 19-CV-12533-WGY
BIO-RAD LABORATORIES, INC., THE UNIVERSITY OF CHICAGO, LAWRENCE LIVERMORE NATIONAL SECURITY, LLC, and PRESIDENT AND FELLOWS OF HARVARD COLLEGE, Plaintiffs, v. STILLA TECHNOLOGIES, INC., and STILLA TECHNOLOGIES Defendants.	)	CIVIL ACTION NO. 19-CV-11587-WGY

YOUNG, D.J. October 23, 2020

MEMORANDUM AND ORDER

I. INTRODUCTION

This memorandum addresses the construction of claims from two related patent cases, both brought by Bio-Rad Laboratories, Inc. ("Bio-Rad"). Bio-Rad has accused two of its rivals in the

field of life science research tools, 10X Genomics, Inc. ("10X"), and Stilla Technologies, Inc. ("Stilla"), of patent infringement. See generally Compl., Bio-Rad v. 10X, 19-cv-12533 (the "10X Case"), ECF No. 1; Compl., Bio-Rad v. Stilla, 19-cv-11587 (the "Stilla Case"), ECF No. 1. In turn, 10X has asserted patent counterclaims against Bio-Rad.

At the current stage of these multi-faceted matters the parties have sought claim construction for certain disputed terms in six of the patents at issue. In the 10X Case, these are U.S. Patent Nos. 8,871,444 (the "'444 patent"), 9,919,277 (the "'277 patent"), and 9,029,085 (the "'085 patent"). See Joint Claim Construct ("10X Joint Claim Construct"), 10X Case, ECF No. 82. In the Stilla Case, these disputed terms draw from U.S. Patent Nos. 9,968,933 (the "'933 patent"), RE 41,780 (the "'780 patent"), and 9,127,310 (the "'310 patent"). See Joint Claim Construct, Stilla Case ("Joint Claim Construct"), ECF No. 90; Amend Claim Construct, Stilla Case ("Amend Claim Construct"), ECF No. 120.

This Court held a Markman Hearing on September 10, 2020. See generally Markman v. Westview Instruments, Inc., 52 F.3d 967 (Fed. Cir. 1995) (en banc), aff'd, 517 U.S. 370 (1996); Tr. Markman Hearing Sep. 10, 2020 ("Markman Tr."), 10X Case, ECF No. 169. The three parties collectively agreed to present nine terms to this Court for construction at that hearing. See Joint

Statement Markman Hearing ("Markman Statement"), 10X Case, ECF No. 153. At the hearing, this Court gave four of the disputed terms their plain and ordinary meaning and the parties agreed on the Court's proposed language for a fifth term. Markman Tr. 35:7-19; 36:14-2; 42:24-43:6; 48:11-15. The Court construed one of the remaining terms and took three under advisement. Markman Tr. 18:14-22; 27:22-23; 34:8-20; 42:22-23. It now rules on two of the terms taken under advisement, and reserves judgment on the other until the point in the litigation where construction is necessary. See infra II.C-F. This memorandum and order summarizes the eight rulings, explains the Court's reasoning in the three terms it construes, and explains why it chooses to withhold judgment on the ninth term.

A. Factual Background

Bio-Rad, 10X, and Stilla are all competitors in manufacturing life science tools that perform digital polymerase chain reaction ("digital PCR" or "DPCR"). See Stilla Case, Am. Compl. ¶¶ 23-26 ("Stilla Compl."), ECF No. 25; 10X Case, Compl. ¶¶ 14-27 ("10X Compl."), ECF No. 1. Polymerase chain reaction ("PCR") is a process for replicating and analyzing DNA samples. "Digital" PCR refers to the use of some kind of partition to examine individual molecular samples, instead of examining a composite of samples en-masse. 10X Compl. ¶ 15.

Bio-Rad is an industry leader in "Droplet Digital"

technology, which partitions biological samples by using chemical reactions to place them in individual microdroplets. Id. One of the techniques this technology enables is the use of droplets to conduct PCR, which is called "droplet digital PCR" or "DDPCR," while another use is to prepare samples for "Next Generation Sequencing" ("NGS"). Id. ¶ 16. 10X competes in the DDPCR and NGS markets through its "Next GEM" line of products, which utilizes its Chromium droplet-based emulsion system. Id. ¶¶ 23-26. Stilla competes in the DPCR market with its "Naica System," which uses crystals as digital partitions. Stilla Compl. ¶¶ 24-26.

B. Procedural History and Relevant Patents

1. Bio-Rad v. 10X

On December 12, 2019 Bio-Rad sued 10X claiming willful infringement, literally or under the doctrine of equivalents, of three patents: claims 1-2, 4, and 8 of the '444 patent; claims 1-6, 8-9, 11, and 13-14 of the '277 patent; and claims 1, 4-15 and 18-26 of Patent No. 10,190,115 (the "'115 patent"). 10X Compl. ¶¶ 32, 49, 64. This Court has already denied 10X's motion to dismiss these claims. See Bio-Rad Labs., Inc. v. 10X Genomics, Inc., Civ. A. No. 19-12533, 2020 U.S. Dist. LEXIS 76156, at *3 (D. Mass. April 30, 2020). In doing so, however, this Court transferred the '115 Patent to the Northern District of California where its parent patent is currently under

consideration. Id. at *30. 10X also filed counterclaims for patent infringement, antitrust violation, and declaratory judgment of non-infringement, amending these counterclaims twice. See Answer Countercl., ECF No. 32; Am. Part. Answer Amend. Counterclaim, ECF No. 53; Answer Am. Countercl. ("10X Countercl."), ECF No. 113. In the patent infringement portion of its counterclaims, 10X accused Bio-Rad of infringing claims 1, 3-9, 11, 18, and 19 of the '085 patent, and claims 7, 9, 10, 13-16 of Patent No. 9,850,526. See Id. ¶¶ 268, 274.

The parties dispute a total of four terms, all of which were considered at the Markman Hearing. See 10X Joint Claim Construct; Markman Statement 2. Both parties have submitted claim construction briefs and supporting documentation, and 10X has submitted an expert's report by Richard B. Fair, PhD. See 10X Prelim. Claim Construct Brief ("10X Brief"), ECF No. 122; Decl. Jennifer K. Robinson Supp. 10X Open Claim Construct Brief ("Robinson Decl."), ECF No. 123; Decl. Richard B. Fair Supp. 10X Open Claim Construct Brief, ECF No. 124; 10X Reply Bio-Rad Prelim. Claim Construct Brief ("10X Reply"), ECF No. 149; Bio-Rad Prelim. Claim Construct Brief ("Bio-Rad Brief"), ECF No. 125; Decl. Justin L. Constant Bio-Rad Prelim. Claim Construct Brief ("Constant 10X Decl."), ECF No. 126; Bio-Rad Reply 10X Claim Construct. Brief ("Bio-Rad 10X Reply"); Decl. Justin L.

Constant Supp. Bio-Rad Resp. Claim Construct Brief ("Second Constant 10X Decl."), ECF No. 150.

The two patents Bio-Rad alleges 10X to have infringed, the related '444 and '277 patents, are both entitled "In Vitro Evolution in Microfluidic Systems" and deal with a method for isolating target genetic elements by sorting compartmentalized microcapsules. See Robinson Decl., Ex. A, United States Patent 8,871,444 B2, ECF No. 123-1; Robinson Decl., Ex. B., United States Patent No. 9,919,277 B2, ECF No. 123-2. Bio-Rad maintains an exclusive license to the '444 and '277 Patents from United Kingdom Research and Innovation ("UKRI") and Harvard University. Bio-Rad 10X Compl. ¶¶ 31, 48. The subject of 10X's counterclaims against Bio-Rad, the '085 patent, is entitled "Assays and other Reactions Involving Droplets." Robinson Decl., Ex. C., United States Patent No. 9,029,085 10XMA00000257, ECF No. 123-3. Its subject matter, according to its abstract, relates to droplets or emulsions that may be used in assays or to form a gel, id., and 10X has an exclusive license to the patent from Harvard University. 10X Countercl. ¶¶ 251-52. Harvard is Bio-Rad's co-plaintiff for the underlying claims but 10X's co-plaintiff for the counterclaims. ECF Nos.

112, 115.

2. Bio-Rad v. Stilla

On July 22, 2019 Bio-Rad sued Stilla for patent infringement. See Stilla Case, Compl., ECF No. 1. This complaint (as amended) alleges infringement, literally or under the doctrine of equivalents, of claims 1-20 of the '933 patent; claims 1-3 of the '780 patent; claims 1-5, 8, and 9 of the '444 Patent; and claims 1-6, 8-11, 15 of the '310 patent. Stilla Compl. ¶¶ 28- 31. Stilla then filed an answer and counterclaims asking for a judgment of non-infringement and invalidity. See Stilla Answer Am. Compl. Countercl. Bio-Rad, ECF No. 39.

The parties dispute a total of ten terms in the '310, '780, and '933 patents, five of which this Court considered. See Joint Claim Construct; Amend Claim Construct; Markman Statement 3-4. Both parties have submitted briefs for claim construction along with supporting documentation, and Stilla has submitted analysis from expert Luc Bousse, PhD. See Bio-Rad Prelim. Claim Construct Brief, ECF No. 108; Decl. Justin L. Constant Bio-Rad Prelim Claim Construct Brief ("Constant Stilla Decl."), ECF No. 109; Bio-Rad Reply Stilla Prelim. Claim Construct Brief ("Bio-Rad Stilla Reply"), ECF No. 135; Decl. Justin L. Constant Bio-Rad Reply Stilla Prelim Claim Construct Brief ("Second Constant Stilla Decl."), ECF No. 136; Stilla Prelim Claim Construct Brief

("Stilla Brief"), ECF No. 110; Decl. Luc Bousse Stilla Prelim. Claim Construct Brief ("Bousse Decl."), ECF No. 111; Stilla Reply Bio-Rad Prelim. Claim Construct Brief ("Stilla Reply"), ECF No. 134.

Bio-Rad is the owner or licensor of the three patents at issue in the Stilla Case. It owns the '310 Patent, entitled "Digital Analyte Analysis," which the abstract describes as an invention related to droplet digital PCR and methods for analyzing nucleic acids. Constant Stilla Decl., Ex. A, United States Patent 9,127,310, ECF No. 109-1. It licenses the '933 patent from the University of Chicago and the '780 patent from Lawrence Livermore National Security, LLC . Am. Stilla Compl. ¶¶ 34-35, 49-50. The '780 patent, entitled "Chemical Amplification based on Fluid Partitioning in an Immiscible Liquid," constitutes a system for amplifying nucleic acid in a sample by partitioning the sample and performing PCR, or for performing analysis on a partitioned sample. Justin Stilla Decl., Ex. B., United States Reissued Patent 41,780 , ECF No. 109-2. The '933 Patent, entitled "Device and Method for Pressure-driven Plug Transport and Reaction," provides microfabricated substrates and methods of conducting reactions in those substrates using plugs transported in the flow of carrier-fluid. Constant Stilla Decl., Ex. G, United States

Patent 9,968,933, ECF No. 109-7.

II. ANALYSIS

A. Legal Framework

Claim construction is the first step in the process of judging whether patent infringement has occurred. Cybor Corp. v. FAS Techs., Inc., 138 F.3d 1448, 1454 (Fed. Cir. 1998). The judge of the case construes claims as matter of law. Markman, 52 F.3d at 979. The Federal Circuit has provided the general framework for conducting claim construction in Phillips v. AWH Corp., 415 F.3d 1303 (Fed. Cir. 2005) (en banc), cert. denied, 546 U.S. 1170 (Feb. 21, 2006).

The claim terms of a patent are "generally given their ordinary and customary meaning." Id. at 1312 (quoting Vitronics Corp. v. Conceptronic, 90 F.3d 1576, 1582 (Fed. Cir. 1996)); see also Omega Eng'g, Inc. v. Raytek Corp., 334 F.3d 1314, 1323 (Fed. Cir. 2003) (quoting CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2002)) ("We indulge a 'heavy presumption' that claim terms carry their full ordinary and customary meaning.). The ordinary and customary meaning of a word is the meaning as understood by a person of ordinary skill in the art at the time of the invention. Phillips, 415 F.3d at 1313. The claim language itself, including the context of the surrounding words and the language of surrounding claim terms, is highly relevant to this construction. Id. at 1314 (citing

Vitronics, 90 F.3d at 1582). For example, the presence of a dependent claim that adds a limitation creates the presumption that the limitation is not present in the independent claim. Id. at 1314-15 (citing Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 910 (Fed. Cir. 2004)).

Claim language is one source of intrinsic evidence; the other two are the specification and prosecution history. Teva Pharms. USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 841 (2015). The person of ordinary skill in the art is assumed to read a claim term in the context of the entire patent, including the specification. Phillips, 415 F.3d at 1313 (citing Multiform Desiccants, Inc. v. Medzam, Ltd., 133 F.3d 1473, 1477 (Fed. Cir. 1998)). "[T]he specification 'is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.'" Id. at 1315 (quoting Vitrionics, 90 F.3d at 1582). Where the specification itself gives to the claim term a specific definition, "the inventor's lexicography governs." Id. at 1316 (citing CCS Fitness, Inc. v. Brunswick Corp., 288 F.3d 1359, 1366 (Fed. Cir. 2002)). Where the specification reveals an intentional disclaimer of the claim's scope, that disclaimer is also dispositive. Id. (citing SciMed Life Sys., Inc. v. Advanced Cardiovascular Sys., Inc., 242 F.3d 1337, 1343-44 (Fed. Cir. 2001).

The third source of intrinsic evidence is the prosecution history, when in evidence. Id. at 1317 (citing Markman, 52 F.3d at 980; Graham v. John Deere Co., 383 U.S. 1, 33 (1966)). This prosecution history includes both the record of the proceedings before the patent office and the prior art cited in that record. Id. Since the prosecution history represents an ongoing negotiation with the patent office it is often less clear than the specification, but it can indicate the inventor's conception of their own invention. Id. The prosecution history may also indicate where the inventor disavowed the scope of a claim in order to overcome an objection from the patent office. Id. (citing Vitronics, 90 F.3d at 1582-83); see also Chimie v. PPG Indus., Inc., 402 F.3d 1371, 1384 (Fed. Cir. 2005) ("The purpose of consulting the prosecution history in construing a claim is to exclude any interpretation that was disclaimed during prosecution.") (internal quotations omitted).

Courts must be wary to avoid divining disclaimers out of ambiguity. "Disavowal is an 'exacting' standard under which it must be established that the patentee 'demonstrate[d] an intent to deviate from the ordinary and accustomed meaning of a claim term' through 'expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.'" Intellectual Ventures I LLC v. T-Mobile USA, Inc., 902 F.3d 1372, 1378-79 (Fed. Cir. 2018) (quoting Epistar Corp. v. International Trade

Comm'n, 566 F.3d 1321, 1334 (Fed. Cir. 2009)). Furthermore, absent either a clear disavowal or an explicit definition provided by the inventor, the embodiment of a patent described in the specification need not be construed to be its sole embodiment. Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir. 2004) (citing Teleflex, Inc. v. Ficosa N. Am. Corp., 299 F.3d 1313, 1327 (Fed. Cir. 2002)).

"In some cases . . . the district court will need to look beyond the patent's intrinsic evidence . . . to consult extrinsic evidence in order to understand, for example, the background science or the meaning of a term in the relevant art during the relevant time period." Teva Pharms., 135 S. Ct. at 841. Extrinsic evidence is subordinate to intrinsic evidence. Phillips, 415 F.3d at 1317 ("[W]hile extrinsic evidence can shed useful light on the relevant art, we have explained that it is less significant than the intrinsic record in determining the legally operative meaning of claim language.") (internal quotation marks omitted)).

B. The Court's Claim Constructions

This Court begins its discussion of the claim construction by summarizing the nine terms submitted for consideration at the September 10, 2020 Markman hearing. Markman Statement 2.

1. '444 and '277 Patents: Ordering of Method Steps

The first dispute in the 10X case concerns the ordering of

four method steps in the independent claim 1 of the '477 and '277 patents. Bio-Rad's proposed construction for both patents is "plain and ordinary meaning." 10X Joint Claim Construct 3. 10X proposes: "The claimed method steps must be performed in the listed order." Id.

At the Markman hearing, this Court adopted the following construction: "The claimed method steps must be initiated in the listed order." Markman Tr. 18:21-22.

2. '444 and '277 Patents: "Label" and "Tag"

The second dispute in the 10X case concerned the meaning of the words "labeled" and "tag" in claim 4 of the '444 patent and claims 5 and 9 of the '277 patent. 10X Joint Claim Construct 4. 10X proposed that these words be interpreted to require a binding compound that induces a change in optical properties, while Bio-Rad requested the plain and ordinary meaning. Id.

This Court ruled at the Markman hearing that the plain and ordinary meaning would hold. Markman Tr. 35:2-6.

3. '277 Patent: Polymerase Chain Reaction

The third dispute is over whether the term "primers for a polymerase chain reaction" in claim 3 of the '277 Patent required definition. 10X Joint Claim Construct 4. 10X proposed a detailed technical definition, while Bio-Rad requested the plain and ordinary meaning. Id.

At the Markman hearing this Court took the matter under

advisement. Hearing Tr. 27:22-23. It now withholds judgment on construction of the claim. This term is sufficiently technical as to require construction, but this Court will be better able to construe it in accordance with the requirements of the case after some opportunity to explore the actual controversy.

4. '085 Patent: "Plurality of Species"

The final contested term in the 10X case is the phrase "plurality of species" in claims, 1, 3, 11, and 18 of the '085 patent. 10X Joint Claim Construct 5. Bio-Rad argued the plurality of species required a "common genus," while 10X defined "species" as "any substance that can be differentiated from the droplet fluid" and "plurality" as taking its plain and ordinary meaning. Id.

This Court took the matter under advisement at the Markman hearing. Hearing Tr. 34:8-20. It now adopts the definitions proposed by 10X, which does not require a common genus. See Joint Claim Construct 5.

5. '310 Patent: Nucleic Acid Molecule

The first dispute in the Stilla case concerns claims 1 and 15 of the '310 patent. Both claims concern a process with a plurality of droplets that contain, or have inserted into them, a nucleic acid molecule. Stilla Am. Claim Construct. 3. Bio-Rad requests the plain and ordinary meaning of these terms, while Stilla argues the nucleic acid molecule must consist of

"no more than a single nucleic acid template molecule." Id.

This Court ruled at the Markman hearing that the plain and ordinary meaning would hold. Markman Tr. 35:2-6. With respect to Stilla's contention that the patentee has disclaimed the patent's scope, this Court remains open to further argument on the subject at the point in these proceedings when it considers the application of the patents to the parties' claims. Id. at 46:7-48:17; cf. Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 535 U.S. 722, 737-38 (2002) (discussing the need to carefully examine the scope of disclaimers made during the prosecution history when applying the doctrine of equivalents).

6. '310 Patent: A Plurality of Different Primer Types

The second disputed term in the Stilla case derives from claims 1, 15, and 27 of the '310 patent. Bio-Rad requests that the contested phrase -- "a plurality of different primer types" -- take its plain and ordinary meaning, while Stilla proposed the following: "more than one set of different primer pairs, each pair . . ." Stilla Am. Claim Construct. 3.

Happily, at the Markman hearing the two parties agreed to the following construction: "more than one set of different primers or primer pairs, each set . . ." Markman Tr. 36:14-23.

7. '780 Patent: Injection Orifice

The next disputed term is the phrase "injection orifice"

from claims 1-3 and 10 of the '780 patent. Bio-Rad requested the plain and ordinary meaning, while Stilla asked this Court to construe the term to mean "small orifice or microjet through which PCR mix (sample and reagent) is forced." Stilla Am. Claim Construct 3.

This Court, at the Markman hearing, adopted the plain and ordinary meaning. Markman Tr. 42:24-43:6.

8. '933 Patent: Forming a Plurality of Droplets

The fourth disputed term in the Stilla case is from claim 1 of the '933 patent and concerns the language "forming a plurality of droplets of the aqueous fluid in the immiscible carrier fluid." Stilla Am. Claim Construct 5. Bio-Rad requested the plain and ordinary meaning, while Stilla proposed: "forming a plurality of volumes of aqueous fluid by introducing a stream of the aqueous fluid into an intersecting flow of an immiscible carrier fluid." Id.

At the Markman hearing this Court proposed the following language: "forming a plurality of droplets of the aqueous fluid by introducing a stream of the aqueous fluid into a flow of an immiscible carrier fluid." Markman Tr. 37:8-16. After Bio-Rad objected, this Court took the matter under advisement. Id. at 42:22-23. It now adopts the language it proposed at the Markman hearing.

9. ’933 Patent: Outlet

The fifth and final disputed term in the Stilla case is the word “outlet” in claims 1 and 7 of the ’933 patent. Stilla Am. Claim Construct 5. Bio-Rad requests the plain and ordinary meaning; Stilla’s construction is: “a junction of a microchannel containing aqueous fluid and a microchannel containing carrier fluid.” Id.

The Court adopted the plain and ordinary meaning at the Markman hearing. Markman Tr. 42:24-43:6.

10. Summary

For each of the four claims terms given their plain and ordinary meaning, this Court has determined that nothing in the intrinsic evidence overcomes the presumption that the customary meaning, as understood by a person skilled in the arts, applies. Vitrionics, 90 F.3d at 1582. The Court’s determinations in the three claim terms it took under advisement, as well as its construction of claim 1 of the ’444 and ’277 patents, demand further explanation.

C. ’444 and ’277 Patents: Ordering of Method Steps

The first claim of the ’444 patent is:

> 1. A method for detecting a product of an enzymatic reaction, comprising the steps of:
>
> providing a droplet generator to produce, under microfluidic control, a plurality of aqueous microcapsules surrounded by an immiscible continuous phase that comprises a fluorinated oil that comprises a fluorinated polymer surfactant, each of the

> plurality of microcapsules comprising an enzyme, a genetic element, and reagents for the enzymatic reaction;
>
> pooling the microcapsules into one or more common compartments such that a portion of the plurality of microcapsules contact each other but do not fuse with each other due to the presence of the surfactant;
>
> conducting the enzymatic reaction on the genetic element of at least one of the plurality of microcapsules within the one or more common compartments; and
>
> detecting the product of the enzymatic reaction.

'444 patent, claim 1. The '277 patent is identical, except that it removes the final line "detecting the product of the enzymatic reaction." See '277 patent, claim 1.

10X argues that the claimed method steps must be performed in the listed order. 10X Joint Claim Construct 3. This Court's construction requires that the claimed method steps be initiated in the listed order. Marksman Tr. 9:9-16. The purpose behind this construction is to allow the claim's scope to encompass the simultaneous performance of steps.

As a general rule, "[u]nless the steps of a method [claim] actually recite an order, the steps are not ordinarily construed to require one." Mformation Techs., Inc. v. Research In Motion Ltd., 764 F.3d 1392, 1398 (Fed. Cir. 2014) (quoting Interactive Gift Express, Inc. v. Compuserve Inc., 256 F.3d 1323, 1342 (Fed. Cir. 2001). Yet a specific order is appropriate where "'the claim language, as a matter of logic or grammar, requires that

the steps be performed in the order written, or the specification directly or implicitly requires' an order of steps." Id. (quoting TALtech Ltd. v. Esquel Apparel, Inc., 279 F. App'x 974, 978 (Fed. Cir. 2008). "A method claim can also be construed to require that steps be performed in order where the claim implicitly requires order, for example, if the language of a claimed step refers to the completed results of the prior step." Kaneka Corp. v. Xiamen Kingdomway Group Co., 790 F.3d 1298, 1306 (Fed. Cir. 2015).

10X argues that claim 1 of both patents "as a matter of logic or grammar requires that the steps be performed in the order written." 10X Brief 4 (quoting Mformation Techs, 764 F.3d at 1398; Amgen Inc. v. Sandoz Inc., 923 F.3d 1023, 1028 (Fed. Cir. 2019)). It references the prosecution history in which the patentee claimed the invention was novel because it allowed for the pooling of droplets before conducting the desired reaction. Id. at 6-7 (citing Robinson Decl., Ex. E, Prosecution History Excerpts '444 patent BIO-RAD-MA00021271-272). It further argues the language of the claim does not permit simultaneous performance (Bio-Rad's preferred construct) because each step of the process cannot be performed until the previous step is complete, and each step of the process references the previous step. Id. at 5.

Bio-Rad argued in its briefs that the language of the claim does not require that the steps be performed in any particular order and that they may be performed simultaneously or overlapping in time. Bio-Rad 10X Brief 2. It averred that 10X's interpretation would require each step to complete before the next step can begin, but that its own preferred embodiments would allow later steps to begin on individual droplets while the composite "plurality of aqueous microcapsules" are still being generated. Bio-Rad 10X Reply 2.

At the Markman hearing Bio-Rad assented to this Court's proposed construction because it allowed for simultaneity. Marksman Tr. 9:23-24. 10X objected. Id. at 12:25-13:1. Its position is that while there may be simultaneous performance of steps on the millions of droplets generated, for each individual plurality or group within that mass (the "plurality of aqueous microcapsules" identified in the first step) the steps must be performed in the listed order. Id. at 14:10-21. Thus, the same "plurality" of droplets undergoes first generation, then pooling, then the enzymatic reaction, then detection. Id. at 14:22-15:5.

As an initial matter, 10X is correct that the language of the claims and the specification support the requirement of a specific order. First, each of the four steps of the claim refers to "the" product of the previous step. See '444 patent,

claim 1. This implies they must be conducted in that order. See E-Pass Techs., Inc. v. 3Com Corp., 473 F.3d 1213, 1222 (Fed. Cir. 2007) ("Substantively, because the language of most of the steps of its method claim refer to the completed results of the prior step, [the plaintiff] must show that all of those steps were performed in order . . ."). Second, the prosecution history makes clear that conducting the enzymatic reaction on the microcapsules in a common compartment was an important factor in the invention's novelty over prior art. '444 patent File History at BIORAD-MA00021271-272. The inventors overcame an obviousness objection from the patent office by amending the claims to their current form and explaining that "[t]he prior art did not recognize the need to pool droplets into a common compartment for conducting reactions, nor that it was possible to pool droplets into a common compartment for reactions without the droplets fusing with each other." Id. at BIORAD-MA00021272. The patentees also explained that the invention allowed for the pooling of microcapsules "for the purpose of conducting a reaction within the aqueous microcapsules" and that such pooling allowed for "a reaction to be conducted and completed prior to reaching a detector." Id. at BIORAD-MA00021272. This argument shows that the first three steps must happen in order. Additionally, while the specification clarifies that the first three steps may be repeated multiple times in any order, this

process always begins with microcapsule pooling, then creation, then reaction. See '444 patent 8:8-14. Then, as a matter of logic, detection of "the product of the enzyme reaction" in the fourth step only makes sense if the enzyme reaction has begun. Thus, the intrinsic evidence backs 10X's argument that the steps must occur in the listed order.

But to say the steps must occur in a specific order is not to say that the claim "does not permit simultaneous performance." 10X Brief 5. 10X's expert Dr. Fair espoused this view in his deposition, saying, "you have to have generated the plurality of aqueous microcapsules, with all the other limitations of that claim element, before Step 2 begins." Second Constant 10X Decl., Deposition of Richard Fair Ph.D ("Fair Dep.") 110:20-23, ECF No. 150-1. Dr. Fair further clarified his belief that even if further "pluralities" of aqueous microcapsules were being produced simultaneous to pooling operations, those new "pluralities" would not be part of the same "pooling operation." Id. at 117:1-14.

Drawing such a fine-grained distinction between different "pluralities" appears unduly burdensome. There is nothing in the claim language or specification indicating how a jury could determine how many different "pluralities" were contained in a pooling chamber, or where one plurality ends and the next begins. The plain language of claim 1 indicates that each step

refers to the molecules from the previous step; further pontification about the multitudinous lesser pluralities contained in the greater plurality would only invite confusion.

This distinction is also unnecessary. The Federal Circuit in Kaneka Corp., examining a patent for producing an oxidized enzyme, noted that the claims required an order but rejected the District Court's conclusion that each step in the oxidization process must have substantially completed before the next had begun. 790 F.3d at 1306:

> The claims do not exclude a process in which every claim step is occurring simultaneously. By the same logic, the extraction step recited in claim 33 does not have to be complete before the oxidation step begins as long as the oxidation step is applied to at least some extracted product. In other words, the claims require order but do not require discrete steps.

Id. Here, too, neither the claim language nor the specification disclaims simultaneous steps. Figures 16A-D show droplets added continuously to a channel as they are produced, indicating that steps one and two may occur simultaneously. See '444 patent Fig. 16 A-D; 10:10-27. Unless this Court added further instructions regarding its multiple-pluralities theory, 10X's construction would exclude a preferred embodiment, which is rarely correct. See Vitronics Corp., 90 F.3d at 1583.

Bio-Rad also contends that 10X's preferred construction would not allow the use of real-time PCR, an analysis technique

that, as explained by Dr. Fair, consists of monitoring "continuously, the product of each PCR cycle using fluorescence." See Bio-Rad 10X Reply 5-6; Fair Dep. 76:21-23. The specification encompasses PCR as an analysis technique. See '444 patent at 10:12-15, 19:45-51, 21:19-21, 22:26-31, 73:1-4. It also cites to two publications on the subject of real-time PCR, see '444 patent 8, 16, showing the inventors were cognizant of the technique. The specification thus suggests that steps 3 and 4 may be able to occur simultaneously. 10X's linguistics-based arguments are insufficient to overcome the fact that the specification itself contemplates simultaneity. See Moba v. Diamond Automation, 325 F.3d 1306, 1314 (Fed. Cir. 2004); Ancora Techs., Inc. v. LG Elecs., Inc., Civ. No. 1-20-00034, 2020 U.S. Dist. LEXIS 150002, at *15 (W.D. Tex. Aug. 19, 2020).

In conclusion, this Court rules that a construction requiring the claimed method steps be initiated in the listed order most-accurately reflects the claim language, specification, and disclaimers made in the prosecution history.

D. '277 Patent: Polymerase Chain Reaction

Claim 3 of the '277 patent reads: "The method of claim 2, wherein the nucleic acids further comprise primers for a polymerase chain reaction (PCR)." In turn, claim 2 describes the method of claim 1 (reproduced above) where the genetic element comprises nucleic acids. 10X requests the following

definition of "primers for a polymerase chain reaction:" "oligonucleotides that are part of a pair of oligonucleotides that flank a DNA sequence to be amplified, anneal to the DNA, and are extended by a DNA polymerase in a reaction in which the extension product becomes DNA bound by another primer in the pair." 10X Joint Claim Construct 4.

10X argues that its definition accurately describes a primer for a polymerase chain reaction and reflects the plain and ordinary meaning of the term. 10X Brief 13. To be more precise, 10x has accurately described the most commonly-used primer for PCR. The question is whether the patent specification defines the scope of "primer" broadly enough to also encompass more esoteric reagents.

10X points to a key source of intrinsic evidence in the '277 patent specification, which is a citation to the publication Saiki, et al., Primer Directed Enzymatic Amplification of DNA with a Thermostable DNA Polymerase ("Saiki Reference") 239 Science 487, 487 (1988). See 10X Brief 16, (citing Robinson Decl., Ex. J., ECF No. 123-10); '277 patent 67:24-26). The '277 patent cites to Saiki Reference as the source for "the polymerase chain reaction . . ." '277 patent 50:6-7. In turn, the Saiki Reference succinctly describes PCR in terms substantively similar to 10X's definition. See Saiki Reference 487. 10X also notes that every instance of the use of

the word "primer" in the '277 patent refers to primers for DNA PCR, which is the process described by the Saiki Reference. 10X Brief 16 (citing '277 patent 59:40-51, 60:43-55). Moving beyond the intrinsic evidence, 10X also cites to the decision in another patent infringement case between these two parties where the judge adopted a definition of "primer" consistent with 10X's chosen definition here. See 10X Brief 14; Robinson Decl., Ex. R., Claim Construction Order, RainDance Techs., Inc. v. 10X Genomics, Inc., No. 1:15-cv-00152-RGA (D. Del. May 30, 2017), ECF No. 179.

Bio-Rad argues that 10X's chosen definition does not describe every type of polymerase chain reaction or every possible primer for such a reaction. Bio-Rad 10X Brief 7. It argues that 10X's definition excludes, for example, reverse-transcription PCR ("RT-PCR"), where primers anneal to RNA rather than DNA, id., and "Semi-Random" PCR, a tool to amplify from known to unknown regions in a source of DNA. Bio-Rad 10X Reply 11.

10X is correct that Bio-Rad's preferred "plain and ordinary meaning" is insufficient construction for this highly-technical term. 10X Brief 13 (quoting Patent Case Mgmt. Judicial Guide, 3rd Ed. 2016, at 5-30 ("[T]he terms most appropriate for construction are technical terms for which the jury may not appreciate an 'ordinary' meaning.")). In Voice Domain Techs.

LLC v. Apple Inc., another session of this Court concluded that the term "cursor position transducer" was sufficiently technical that a precise definition would be helpful for the jury. Civ. A. No. 13-40138, 2015 U.S. Dist. LEXIS 101865, at *40-41 (D. Mass. Aug. 4, 2015) (Hillman, J.). "Primer for PCR" is no less technical of a phrase.

External evidence may be permissibly used to educate this Court's understanding of technical terms, though it cannot contradict the intrinsic evidence. Teva Pharms. USA, 135 S. Ct. at 841. Accordingly, this Court turns to a science textbook cited by both parties. 10X cites for its definition of "primers" to the 2002 textbook Alberts et. al., Molecular Biology of the Cell ("Alberts Textbook") 508-509 (2002). See 10X Brief 14-15 (citing Robinson Decl., Ex. I, ECF No. 123-9). The Alberts Textbook summarizes the PCR process as follows:

> Two sets of DNA oligonucleotides, chosen to flank the desired nucleotide sequence of the gene, are synthesized by chemical methods. These oligonucleotides are then used to prime DNA synthesis on single strands generated by heating the DNA from the entire genome. The newly synthesized DNA is produced in a reaction catalyzed in vitro by a purified DNA polymerase, and the primers remain at the 5' ends of the final DNA fragments that are made.

Alberts Textbook 508. The textbook further explains that the "chain reaction" occurs because the newly-generated fragments serve as templates for future reaction, thus allowing the number of target DNA fragments to double with each cycle, and a single

target nucleotide to be multiplied manifold times. Id. The textbook also mentions that the length of the multiplied fragment "corresponds to the distance between the two original primers," id., thus emphasizing the importance of having exactly two oligonucleotides.

Bio-Rad cites to the Alberts textbook as well, arguing that 10X's definition is insufficiently broad to cover less-common version of PCR that use a single primer rather than a primer pair such as reverse-transcription PCR. Bio-Rad 10X Brief 7 (citing Constant Decl., Ex. 7, Albert Textbook Figure 8-40, ECF No. 126-7). The Alberts Textbook explains RT-PCR as follows:

> To use PCR to obtain a cDNA clone of a gene, mRNA is first purified from cells. The first primer is then added to the population of mRNAs, and reverse transcriptase is used to make a complementary DNA strand. The second primer is then added, and the single-stranded DNA molecule is amplified through many cycles of PCR

Albert Textbook Figure 8-40. Bio-Rad also cites to a separate method using a single primer to conduct "Semi-Random" PCR, a tool to amplify from known to unknown regions in a source of DNA. Bio-Rad 10X Reply 11. Descriptions of this methodology are available in the Stilla Case. See Second Stilla Const. Decl. Exs. 2-3, ECF No. 136-2,3.

A review of these external sources indicates that for all types of PCR, the plain and ordinary meaning of "primer" is, at its most basic, a construct of oligonucleotides that amplifies a

strand of DNA through a reaction. This Court now returns to the intrinsic evidence to determine whether that definition can be refined further.

The intrinsic evidence is not decisive, though the sole embodiment reflects 10X's construction that a "pair" of oligonucleotides is required. Every instance of "primer" in the specification refers to a primer used in DNA PCR. See, e.g., '277 patent 58:4; 58:21; 59:43; 60:26. Similarly, all of the example primers in the sequence listing are listed as "Type: DNA." Id. at 69-74. Where "the polymerase chain reaction" is defined, it is related to the Saiki Reference that requires paired primers. Id. at 20:19-20. 10X's interpretation is also consistent with Bio-Rad's preferred construction of "polymerase chain reaction" in Bio-Rad Laboratories, Inc. v. 10X Genomics, Inc. See Robinson Decl., Ex. G, Joint Claim Construction Brief, C.A. No. 18-1679 (D. Del. May 26, 2020), ECF No. 123-7. In that case, Bio-Rad's definition of the term included the phrase "target sequence in a mixture of genomic DNA," which lines up with 10X's current definition. Id.

That said, Bio-Rad is correct that there is nothing in the specification that disclaims a broader scope, and that there are other types of PCR reactions aside from that described by Saiki's Reference. Bio-Rad 10X Reply 11. It is not clear from the specification if the '277 patent itself is capable of

enabling this type of PCR, but that does not constitute a disavowal of claim scope. As the Federal Circuit has stated repeatedly, "[w]e have also 'expressly rejected the contention that if a patent describes only a single embodiment, the claims of the patent must be construed as being limited to that embodiment.'" Continental Circuits LLC v. Intel Corp., 915 F.3d 788, 797 (Fed. Cir. 2019) (quoting Phillips, 415 F.3d at 1323; citing Liebel-Flarsheim Co. v. Medrad, Inc., 358 F.3d 898, 906 (Fed. Cir. 2004)).

Overall, this Court is convinced that 10X's definition is closer to the mark than Bio-Rad's request for a "plain and ordinary meaning" construction. Nevertheless, insofar as 10X's definition would narrow the scope of the word "primer" to exclude oligonucleotides that are not paired, this Court is unconvinced that the intrinsic evidence supports this narrower construction. This Court thus invites Bio-Rad to propose its own definition of "primers for a polymerase chain reaction," and will construe the claim term at a future point in these proceedings.

E. '085 Patent – "Plurality of Species"

The first step of Claim 1 of the '085 patent reads:

> A method, comprising: providing a fluidic droplet containing a plurality of species; causing the fluidic droplet to form a gel droplet containing the plurality of species, wherein the plurality of species are bound

to the gel droplet

'085 patent, claim 1 (emphasis added). Claims 2, 3, 11, and 18 are all dependent claims based on claim 1, where the "plurality of species" comprise, respectively, nucleic acids, polynucleotides, gel droplets, and polynucleotides. Id. Claims 2, 11, 18. Claims 2-12, 18, 20 and 21 are all dependent on either claim 1 or 3. Id.

The parties' contest boils down to whether the phrase has a meaning independent of the two words "plurality" and "species." Joint Claim Construct 5. Bio-Rad argues that a person of ordinary skill in the arts would understand the phrase "plurality of species" to require some unifying property. Bio-Rad 10X Brief 8 (citing Constant Decl., Ex. 4, Oxford English Dictionary "Species" 8, ECF No. 126-4 ("a class composed of individuals having some qualities or characteristics, frequently as a subdivision of a larger class or genus")). It contends that each specific usage of "plurality of species" in the claims refers to a class of like items. Id. at 9 (citing '085 patent, claim 3 (nucleic acids), claim 18 (polynucleotides)). It also argues that 10X's construction would cover a droplet with one reactive and one inert substance, a construction that reads out the "plurality" language. Id. It further argues that if any two substances can constitute different "species" than the word is meaningless. Bio-Rad 10X Reply 13. To bolster its argument,

it points to the prosecution history, noting that the requirement for multiple separate species was added during the process to defeat an obviousness objection. Bio-Rad 10X Brief (citing Constant Decl., Ex. 5, App. No. 12/529,926 Amended Claim, ECF No. 126-5).

10X argues the intrinsic evidence supports its interpretation: "species" is defined without limitation, and the addition of the word "plurality" does not change that. 10X Brief 19. It argues the phrase "plurality of species" means simply two or more discernable species. Id. at 19. It also argues there is no basis in the intrinsic evidence for adding 10X's "genus" requirement. Id.

10X is correct based on the intrinsic evidence, which takes precedence over any contradictory external evidence such as a general-purpose dictionary. See Phillips, 415 F.3d at 1321. Here, the intrinsic evidence contradicts Bio-Rad's "genus" requirement. While nowhere in the specification is the term "plurality of species" used, nowhere, also, is there any indication whatsoever that the claims are intended to refer only to related molecules. See generally '085 patent. In fact, there is abundant language to the contrary. The word "species" is used numerous times, and from the specification it is clear that the word, used by itself, refers to any discernable substance that can be added to a fluid. See '085 patent 4:4-11

(listing "species" broadly to include nucleic acids, proteins, peptides, enzymes, nanoparticles, dyes, chemicals, and so on), 15:21-25 (providing as examples of species dissolved in water: "a salt solution, a saline solution, a suspension of water containing particles or cells, or the like"). The patent is clear that different types of species (i.e., both hydrophobic and hydrophilic species) can be delivered in a single droplet. Id. 4:25-27; see also id. at 10:54-61 (teaching a species may be "any substance that can be contained in any portion of a droplet and can be differentiated from the droplet fluid" and that droplets "may contain one or more species"); id. at 10:63-11:22 (teaching that emulsions can contain hundreds of different species). None of the claims, under Bio-Rad's construction, would cover the embodiments in the specification covering single microcapsules containing diverse and disparate species. Its reading therefore contradicts the specification.

Bio-Rad's concern that 10X's interpretation could effectively cover a microcapsule with a single species is not supported by the intrinsic evidence. Bio-Rad notes that the inventor put in the "plurality" language to overcome a challenge based on prior art by Trnovsky that taught a method for analyzing a single chromosome. Bio-Rad 10X Brief 9 (citing Constant 10X Decl., Ex. 5, '085 Patent Amendment 2, ECF No. 126-5; Id., Ex. 6, '085 Patent History Remarks ("'085 Patent

Remarks") 6-7, ECF No. 126-6. It argues that a chromosome constitutes multiple substances, thus under 10X's definition constitutes multiple separate species, so 10X's definition would allow it to reclaim scope it disavowed by inserting the word "plurality" into the claims. Id. This is a red herring. The prosecution history shows that the inventors distinguished Trnovsky because that prior art concerned a "single entity" (the chromosome) rather than a "plurality" of entities. '085 Patent Remarks 6-7. A single entity such as a chromosome is not equivalent to a plurality of species merely because it is molecularly complex. See '085 patent 4:3-5 (describing the storage in a droplet of "cells" and "other species."). A cell is larger and more complex than a chromosome, so if a cell can be a type of species, a chromosome can be as well. 10X's proposed definition accords with the prosecution history because the multiple unique substances that make up a complex entity such as a cell or chromosome are not separately "differentiated from the droplet fluid;" but rather, it is the entity (the cell, chromosome, protein, dye, or so on) that is differentiated from the droplet fluid.

Bio-Rad's proposed definition is not entirely baseless; there is some external evidence that supports the idea that "plurality of species" means a unified group or members of the same genus. For example, the court of Customs and Patent

Appeals in 1960, while discussing the patent rules for disclosure of covered chemistry groups, explained: "it may not be necessary to enumerate a plurality of species if a genus is sufficiently identified in an application by 'other appropriate language.'" In re Grimme, 274 F.2d 949, 952 (Cust. & Pat. App. 1960) (internal citations omitted). Other cases that use the phrase "plurality of species" also treat it as a term referring to a unified group. See Aventis Pharms., Inc. v. Barr Labs., Inc., 335 F. Supp. 2d 558, 567 (D. N.J. 2004) (noting that the patent office found a group of pharmaceutical compositions "encompassed a plurality of species."); Scripps Research Inst. v. Illumina, Inc., Case No. 16-cv-661, 2017 U.S. Dist. LEXIS 57740, at *16 (S.D. Cal. April 14, 2017) ("A library comprising a plurality of species of bifunctional molecules according to claim 1."). Bio-Rad cannot rely on these historical court cases, however, because all of this is external evidence, and the intrinsic evidence here takes precedence. See Phillips, 415 F.3d at 1317.

In conclusion, 10X's definition of "species" -- "any substance that can be differentiated from the droplet fluid" -- and the plain and ordinary meaning of "plurality" best reflect the intrinsic evidence. This Court adopts its proposal.

F. '933 Patent: Forming a Plurality of Droplets

The disputed term in claim 1 (underlined) comes from the fourth step of the sole independent claim of the '933 patent: "forming a plurality of droplets of the aqueous fluid in the immiscible carrier fluid at the outlet of the microchannel . . ." Stilla Am. Claim Construct 5. Bio-Rad contends this term should take its plain and ordinary meaning; Stilla argues it should be read as: "forming a plurality of volumes of aqueous fluid by introducing a stream of the aqueous fluid into an intersecting flow of an immiscible carrier fluid." Id.

Stilla's proposal is based on the definition of "plug" as used in the specification. See '933 patent 9:35-9:42. Stilla argues that the specification uses the terms "plugs" and "droplets" synonymously, and that the investors defined the scope of the "plug" term. Stilla Brief 15-19. In making this argument, Stilla relies on the prosecution history of five related patents, as these alleged disavowals are not in prosecution history of the '933 patent itself. Id. at 17-19. Bio-Rad argues that the '933 patent claim is sufficiently different from its familial patents that limitations from those patents should not be carried over. Bio-Rad Stilla Reply 17 (citing Sanofi v. Watson Labs. Inc., 875 F.3d 636, 650 (Fed. Cir. 2017)). It also argues that "plug" and "droplet" are not used synonymously in the specification. Id.

There is significant intrinsic evidence to back Stilla's argument that "plug" and "droplet" are used synonymously. The Patent itself is titled "Device and Method for Pressure-Driven Plug Transport and Reaction," and the description of the invention in the abstract refers to the objects being carried in the immiscible fluid uniformly as "plugs." '933 patent 1:3-6; 2:63-3:59. "Plugs" in the specification are defined as follows:

> "Plugs" in accordance with the present invention are formed in a substrate when a stream of at least one plug-fluid is introduced into the flow of a carrier-fluid in which it is substantially immiscible. The flow of the fluids in the device is induced by a driving force or stimulus that arises, directly or indirectly, from the presence or application of, for example, pressure, radiation, heat, vibration, sound waves, an electric field, or a magnetic field.

'933 patent 9:35-9:42. The specification also illustrates this term, using drawings that uniformly indicate the intersection of fluids. See '933 patent Figs. 2A-2, 5, 6, 7A–B, 8C–D, 9A–B, 10A, 11, 17, 25A–C, 26A–B, 27B, 30, 44A–D, and 45C–D.

The word "droplet" is never used in the specification. See generally '933 patent Specification. The claims use the term "droplets" instead of plugs, but the language used to describe these droplets in claim 1 parallels the description of plugs in the overview of the invention. See '933 patent 2:63-3:15. Bio-Rad argues that interpreting "droplet" in this way amounts to unlawful construing of the term as limited to a single embodiment. Bio-Rad Stilla Reply 17 (quoting Liebel-Flarsheim

Co. v. Medrad, Inc., 358 F. 3d 898, 906 (Fed. Cir. 2004)). This misconstrues the purpose of the analysis. This analysis is aimed at determining if the "droplet" as used in the '933 patent claim is the same object as the "plug" discussed in the familial patents and in the '933 patent specification, rather than an attempt to limit "droplet" to mean only "plug" in the claim. Ultimately, the claim must "conform to the invention as set forth in the remainder of the specification and the terms and phrases used in the claims must find clear support or antecedent basis in the description." 37 C.F.R. § 1.75. As the word "droplet" appears nowhere in the specification, the claims can only be supported by the specification if "plug" provides the antecedent basis.

The prosecution history backs this point up. The '933 patent is the continuation of a series of previous patents, "the contents of each of which are incorporated herein by reference in their entirety." '933 patent 1:8-21. The intrinsic evidence from these patents is relevant to claim construction for patent '933 insofar as they relate to the same subject matter. See Ormco Corp. v. Align Tech., Inc., 498 F.3d 1307, 1314 (Fed. Cir. 2007). The first patent in the '933 patent's lineage is U.S. patent No. 7,129,091, which claimed priority to provisional patents No. 60/379,927 and 60/394,544. The applications for both of these provisional patents contain the following

definition: "the term 'plug' refers to the droplets . . . that form when at least one reagent fluid combine with a carrier fluid that is substantially immiscible with at least one of the reagent fluids and flow of the fluids is induced by pressure." Bousse Decl., Ex. U-V, Provisional Applications, ECF Nos. 111-21, 22.

The prosecution history reveals that the University of Chicago discussed in-depth the '933 patent's ancestor, U.S. Patent No. 8,889,083, see '933 patent 1:14-15, and its family patents in response to an opposing petition for inter partes review ("IPR") before the Patent Board. See Bousse Decl., Ex. W, IPR2015-01157 Patent Owner's Preliminary Response ("Chicago POPR"), ECF No. 111-23. Statements made during IPR proceedings, including in preliminary responses filed prior to board proceedings, are part of the prosecution history and are relevant to claim construction. See Aylus Networks, Inc. v. Apple Inc., 856 F.3d 1353, 136-62 (Fed. Cir. 2017). The inventors defined the terminology in this patent family: "the inventions of the Ismagilov Patents are based on the use of microfluidic droplets, which are referred to in the Ismagilov Patents as 'plugs.'" See Chicago POPR 7. The specification of the '933 patent is identical to the '083 patent. See U.S. Patent No. 8,889,083. The intrinsic evidence thus makes clear that when the term "plug" is used elsewhere in the prosecution

history of the familial patents, it carries a meaning similar enough to "droplet" for the two to constitute the same "subject matter." Ormco Corp., 498 F.3d at 1314.

Stilla is also on firm ground in arguing that the definition of "plug" in the prosecution history requires a stream of aqueous fluid flowing into a carrier fluid. The Chicago POPR, when discussing the definition of "plug of aqueous fluid," states that the "broadest reasonable construction of the term" is the one from the specification, in part because "[E]very single embodiment in the specification discloses the formation of plugs in this manner, making overwhelmingly clear that this is the defining attribute of plugs." Chicago POPR 21-22. The "broadest reasonable interpretation" during examination necessarily cannot be narrower than final scope of the patent because, in order to achieve patentability, the final scope incorporates disavowals or alterations made to this "broadest" interpretation. In re Am. Acad. of Sci. Tech Ctr., 367 F.3d 1359, 1364 (Fed. Cir. 2004) (citing In re Yamamoto, 740 F.2d 1569, 1571 (Fed. Cir. 1984). The inventors have therefore already acted as the "lexicographer" of the term "plug," and Bio-Rad cannot now claim the term covers a wider scope than the inventors' "broadest reasonable interpretation." See Johnson Worldwide Assocs. v. Zebco Corp., 175 F.3d 985, 990 (Fed. Cir. 1990).

Bio-Rad's remaining argument is that any disclaimers in the prosecution history of the '933 patents' family are irrelevant because the '933 patent claims refer to droplets. Bio-Rad Stilla Reply 16 (citing Regents of Univ. of Minn. v. AGA Med. Corp., 717 F.3d 929, 943 (Fed Cir. 2013); Sanofi, 875 F.3d at 650. It is correct that the claims differ substantially between the two patents. Compare '833 patent with '933 patent. The underlying technology of the droplets, however, as embodied in the specification, is the same. "When the purported disclaimers are directed to specific claim terms that have been omitted or materially altered in subsequent applications (rather than to the invention itself), those disclaimers do not apply." Bio-Rad Stilla Reply 17 (quoting Sanofi, 875 F.3d at 650) (emphasis added). Here, the definition of "plug" from the prosecution history applies to the underlying technology that is common between the two patents -- the "invention" -- rather than to specific claims. It therefore remains applicable to the '933 patent.

With all that said, Stilla's definition adds an additional word that does not appear in the "plugs" definition, that word being "intersecting." Stilla Claim Construct 5. This Court must interpret the claim term in accordance with the "plugs" definition in a manner that neither broadens nor narrows it. Accordingly, it adopts a slightly-modified version of Stilla's

proposed language: "forming a plurality of droplets of the aqueous fluid by introducing a stream of the aqueous fluid into a flow of an immiscible carrier fluid."

III. CONCLUSION

The Court puts forward these eight constructions as a starting point from which the parties may work. If the Court considers it helpful to modify these constructions to better explain them to the juries or ratify the agreement of the parties, it will not hesitate to do so.

SO ORDERED.

/s/ William G. Young
WILLIAM G. YOUNG
DISTRICT JUDGE